

# The Transition from Contemporary to Virtual User Interfaces for Web-Based Services

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**Abstract:** Computer and Internet based services are increasingly provided to users in our days. The users are also increasing exponentially and it is obvious that they are not experienced in the use of computers. This paper examines the problem of user friendly web based service interfaces and proposes a new kind of interface. This interface is called a Virtual Interface and is thoroughly presented. The Virtual Interface is compared to contemporary User Interfaces and the results of this comparison are also presented.

## Introduction

In our days, it has become essential to be able to work with computers and communicate through them. In order to improve the efficiency of Human-Computer Interaction, computer and software manufacturers have developed friendly user interfaces. A User Interface (UI) in general is the medium between man and the computer that facilitates all human attempts to use the computer's potential in an easy way.

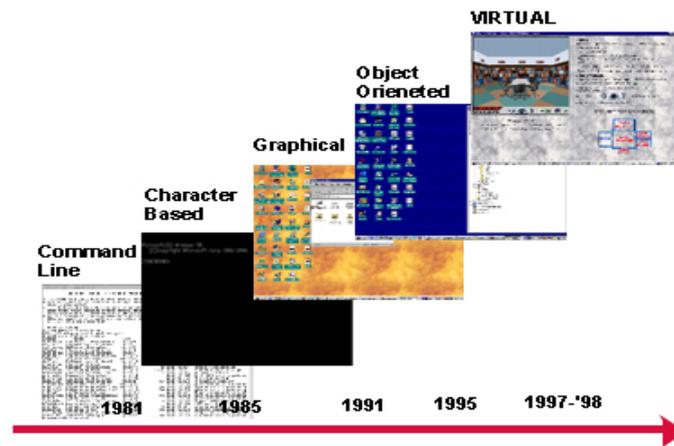
User interfaces have come a long way since their first introduction. They have been evolving ever since, trying to keep up with the computer technology evolution. Even so, during all the years of user interface evolution, the user environment that they presented remained very unfamiliar to the inexperienced user. Lately a new trend in computer user interfaces has arisen. This trend is the introduction of Virtual Use Interfaces and is becoming widely accepted by the computer industry.

## User Interfaces for Web-based services

### Definition of User Interface and its evolution

The term 'User Interface' is generally used to describe the methods and the devices that are used to accommodate interaction between machines and the humans that use them. Human-Computer Interaction consists of many kinds of interactions. A HCI takes place during the use of every computer-based system and environment such as a touch screen, an Operating System and most recently, the Web.

Human-Computer Interaction has been facilitated by UIs from the beginning of computer existence. At first the UIs were very simple and very difficult to understand. This was not strange though, since the users of almost all computers were the people who invented them. As time went by and computers became an integral part of everyday life, common people were becoming computer users. Due to this change UIs had to be improved in terms of the experience that was required from their users. Thus, the UIs were driven from the older text based interface to the Graphical User Interfaces (GUIs).



**Figure 1** The evolution of User Interfaces

This family of UIs focuses on the needs of Human beings and in this way has reduced the training and experience that was considered necessary for a user to use a computer. In this paper the term ‘User Interface’ will be used to describe the software that facilitates the use of a Web based service and handles the interaction process between the computer and the user.

### **Definition of Web-based services and their User Interface requirements**

In recent years the World Wide Web (WWW) is being used for all kinds of applications and communication. The wide spread use of this new means has made it very attractive to use as a platform for the implementation of existent and new services. A Web-based service is nothing more than the implementation and the provision of an already available contemporary service (such as the yellow pages) or a new service (such as a virtual library) through the WWW. The use of the WWW as a platform for the implementation of various services has many obvious advantages, such as the broadening of the range of the targeted users, but also has to face a very serious problem. This problem is the need to develop the UIs in order to help the inexperienced WWW users to understand and use the implemented web service, in other words the problem of designing easy to use Web User Interfaces (WUIs). Human-Computer Interaction is becoming Human-Web Interaction in our days and the WWW is being used really often, while its use is likely to expand even more. Thus, the need for the implementation of friendly and easy to use WUIs should be given a lot of attention by future developers.

### **What should a UI of a Web-based service contain**

The two major characteristics of any UI that accommodates Web-based services (already mentioned as Web User Interface or WUI) must be user friendliness and user need facilitation. In other words a WUI must make the service easy to use and at the same time it must be able to attract new users. In our days, the profile of the Internet and Web user is getting closer to the profile of an every day person. Statistics show that almost one third of the citizens of the United States use the WWW and in Europe the WWW users’ numbers are increasing rapidly. In order to address the user’s needs, WUIs must be able to present the information required from and inserted into a Web-based service in a way that it resembles what users see and experience in the real world.

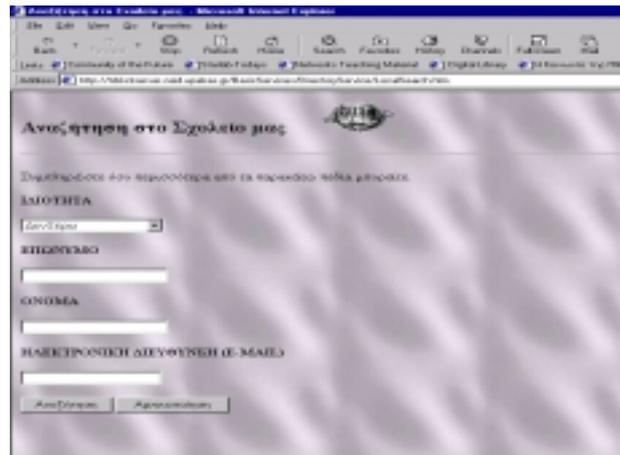
### **Contemporary user interfaces – An implementation instance**

In order to distinguish between contemporary and virtual user interfaces, we present an implementation instance for each case. These implementation instances concern interfaces developed specifically for access to an existent Directory Service.

In the case of the contemporary user interface, a simple but functional interface was developed over the Directory Service. This interface was developed following all the existent conventions and methodologies for the deployment of WUIs. Thus, the user interface interaction cycle is [Rees 1996]:

- user clicks a command button
- browser sends state/contents of form elements to Web server
- Web server runs (CGI) script to generate new HTML page to transmit to browser
- browser displays new page

More specifically, the first page of the WUI designed contains a typical collection of Web-based form fields for the user to fill in. We reduced the amount of the information required from the user by eliminating the form fields that must be filled in. In this way, the WUI became as light as possible. Our aim was to lift the burden of the application from the user and impose it on the underlying service.



**Figure 2** *The Contemporary User Interface*

We also tried to reduce the instructions towards the potential users as much as possible, as this may often be confusing and repulsive for those that are either inexperienced or in a hurry. Recent studies have shown that:

- Users don't like to read
- Text should be scannable
- Simple and informal writing is preferred
- Credibility is an important issue
- Users want to get their information quickly
- Text should be concise

Based on the above, the WUI designed retains its simplicity without compromising in terms of functionality.

The user has to fill in the forms presented to him in any way convenient to him. Keeping in mind that the WUI was developed for a Directory Service, the user can fill in the forms with either a part or the whole of the information he wants to search the Directory for. The underlying application is responsible for the error handling, thus protecting and facilitating the end user. Short and friendly error messages redirect the user to the correct position inside the WUI in order for him to re-impose his search query. When all the available information is inserted through the WUI into the service, the user has to press the submit button and wait for the interface to return the results of his search in a similarly comprehensible format.

From a technical point of view, the browser gives immediate feedback on the state of each individual interface element. Since effective user interface design requires interface elements to be tightly coupled, the selection in a drop-down menu may mean that other buttons/selections/fields should be disabled (grayed out or absent) since their existence is not appropriate for that selection. Furthermore, all information inserted before an error alert, except for the erroneous part, is preserved and reloaded in the new Web page presented to the user in order to re-submit his query. In this way, the WUI carries the responsibility for protecting the user from the redundant task of re-inserting all the necessary information, each time an error occurs.

## **Virtual user interfaces – An implementation instance**

### **Designing Virtual user interfaces**

The idea of a Virtual User Interface (VUI) lies on the potential to embed Web-based services into realistic three-dimensional Virtual Worlds (VWs) [Earnshaw 1995]. The developer of a VUI should initially conceive the 'Theme' of the VWs comprising it. By the term 'Theme' we refer to the instance of the real world that is virtually represented in the VUI. Examples stemming from actual implementations, include virtual representations of Exhibition Centers, Libraries, Schools etc. Consecutively, the developer has to design and implement the necessary VWs with respect to several constraints, some of which are described below. In [Schneiderman 1997] we are presented with three central concerns that all designers of VWs should have:

- The user must be able to imagine that the world portrayed is real, by the world's behavior
- The presentation of the virtual worlds should enrich the experience for participants, so that the VUIs will not become dull and emotionally flat
- Since the user has influence on the Virtual Worlds, the creator cannot plan the exact sequence of events. Therefore, all possible situations must be anticipated and predicted during the designing stage.

Apart from the artistic effect and outline of VWs, the developer must pay particular attention during the design phase to the potentials of his VWs, so that later on all, functionalities provided by the underlying service will be able to correspond to actions in the VWs.

Important aspects concerning the design of VUIs include among others [Schneider 1996]:

- The VUIs must be productive as collaboration tools and enhancement factors for learning
- They should support multiple communication channels meeting the needs of different user groups
- They should support a large variety of media (e.g. text, graphics, sound, etc.)
- They must adapt to the users and not the other way round
- They must plan for change, growth and transformation
- They should contain objects that can be manipulated
- They can be enhanced with artificial agents or more generally can integrate Human-Computer Collaborative Learning Systems (HCCLS) with Computer-Supported Collaborative Learning Systems (CSCLS).
- They should have comprehensible and realistic navigation features
- At this point, the expansion of VWs to Distributed Virtual Worlds (DVWs) can be introduced.

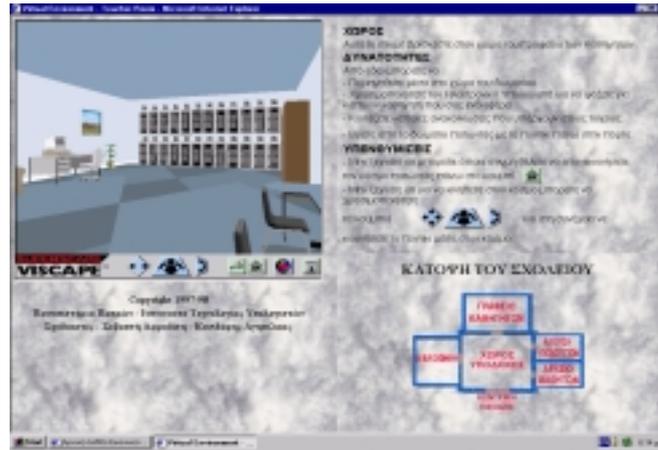
DVWs allow multiple users to share the same VW, and so can be used for CSCW applications. This is so because the three dimensional nature of the shared workspace allows the policies used to manage communication and access to shared resources in traditional CSCW applications to be replaced by a more natural use of space and body language. Applications that are currently being explored include visualisation, teleconferencing, simulation, training, education and entertainment. These applications have widely varying requirements of the environment in which they are performed. According to the above, the designer of the VUI has to decide whether his product must support distributed use, based on its functionalities, and if so expand his VUI into a Distributed VUI (DVUI).

An important aspect in the process of designing DVUIs is user embodiment [Benford 1995]. By user embodiment the authors refer to the provision of the interfaces with appropriate body images representing each user in the DVUIs. Embodiment design issues include: presence, location, identity, activity, availability, history of activity, viewpoint, action point, gesture, physical properties, active bodies, time and change, truthfulness, efficiency and many more.

### **Description of a Virtual User Interface**

Our implementation of a virtual user interface over an existent Directory Service involved the design and realization of a VW, which in our case was developed having as theme the teachers' office in a contemporary school. The VUI that we designed provides Directory Services to inexperienced users in such a way that only fundamental skills on the use of computers, such as navigating in a virtual world using the mouse movement, are required.

It consists of three unequal frames into which the Web-browser window is divided. The VW is shown in Frame 1. In Frame 2 constant text-based help to the user is provided, while Frame 3 is used for interaction between the VUI and the user. Through Frame 3 and the VW, the user enters information required from the underlying Directory Service and sees the results of his actions.



**Figure 3** *The Virtual User Interface*

As the user enters the virtual room, he finds himself in front of a set of cabinets through which the Directory Service is mainly provided. The searching procedure to be followed is: click on the cabinet which holds the first letter (from A to Z) of the name of the entity to be found through the Directory Service, click on the appropriate name from the ones beginning with the specific letter, as they appear on a folder coming out of the cabinet and then receive information on the entity. This information is available in the form of a card (like a library card) coming out of the aforementioned folder. In the case of a human entity, the card consists of a photograph, information and several functionalities e.g. a button on which the user can click in order to send e-mail to the person presented. At any moment the user is able to recommence his trip in the VUI and initiate another search into the Directory Service.

### Using frames in Web interfaces

The issue of using frames in web design is somewhat controversial. The most important problems are the following:

- The simplicity of the original “one page per time” web browsing may be lost in the complexity of frames
- The page may not be able to be bookmarked
- Browser URL’s do not comply with the information seen on the user’s screen but with the initial frameset
- Many users still use previous versions of browsers
- Print problems may occur
- Authoring problems may occur
- Search problems may occur
- Frames are against most of the users’ preferences

The problems that may occur by using frames and that were mentioned above can be surpassed by the frame implementation that we propose. The basic idea is to embed the fully-functional VWs in Frame 1 and use the other two frames as ‘aid-providing’ frames. Since VUI implementation is not very wide spread at the moment the idea of providing a service that would consist only of the VWs might prove to be quite hazardous. The environment that we propose is highly integrated and uses frames as cooperating modules.

### Advantages and Disadvantages that come with the use of VUIs

There are many advantages in using VUIs instead of contemporary interfaces in the implementation of Web-Based services. The most important advantages are mentioned below:

- The VUI approaches the real world representation of the provided service. Thus, an inexperienced user may easily familiarize with the service provided through the VUI.
- The user doesn’t navigate for a long time and does not memorize some complex URL to use the service.

- Statistics show that the Web users do not want to read a lot while visiting Web pages. A VUI minimizes the reading required in order to use a service since it is not text-based but graphic-based.
- Statistics have also shown that users do not like to scroll through long pages on the Web. The use of Virtual interfaces also eliminates this disadvantage of contemporary UIs.
- Another major advantage that comes with the use of VUIs is the added value that they provide to the implemented service. VUIs can be easily enriched at any moment with functionalities.
- The VUI can easily be customized to address specific user preferences.
- The future of many technologies is for them to be integrated. In our days we are looking at the attempt to integrate the WWW with television by creating a new medium called the Web TV.
- The use of VUIs facilitates the use of the WWW as an advertising and promotion medium.

Even though there are many advantages that come with the use of the VUIs, there are still certain disadvantages that derive from the fact that the technology is still new and not tested:

- The greatest disadvantage of the use of VUIs on the WWW as we know it today is imposed by bandwidth limitations. VUIs must be downloaded to the user's personal computer first, in order to be viewed.
- Most of the VUI implementations require a plug-in for the user's browser in order to be viewed. This makes the user download the plug-in before using the VUI, something that may also discourage him.
- There are no widely accepted standards in the field of VW implementation at the moment. This may discourage big companies to use the new technology.
- The technology is not supported by many older browser versions, that many users still use.

## Conclusions and Future work

In this paper we have shown the potentials of the new Virtual Environments technology and a way that it may be integrated into a VUI. It is almost certain that this technology will mature and attract more attention in the future. Its use is a good solution to the uprising demand by WWW users around the world for more Web-based services. Our future work will focus on the subjects of linking databases and making them co-operate with the virtual environment [Bouras 1998] as well as creating educational Distributed Virtual Environments (DVEs). Both of the above will raise the functionalities of such environments to such a level that many established current technologies will become obsolete and be replaced. The next step in the way of further development of the proposed VUI is to make it customizable. As in all customer/user oriented WWW services the capability for customization is a key feature that must be supported.

We must note that we are convinced that VUIs may become a new means that will bring people from different parts of the world together and facilitate people with all the services that may have been formerly not accessible.

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